

IN THE SPECIFICATIONS

Please insert the following at page 2, line 1:

CROSS REFERENCES TO RELATED APPLICATIONS

This application is a continuation of United States Patent Application Ser. No.

09/870,287 filed on May 30, 2001, now United States Patent XXXXXXXX

Please amend paragraph [0007] as indicated:

[0007] Immediately following the application of the “flipping” RF magnetic field, the spin vectors are all pointing in the same direction, and ideally as they precess, they should continue to point in a common direction. In real situations, the strength of the static field is inhomogeneous in space. As a result, the spins will tend to precess at different rates. The different precession rates ~~causes~~ cause the vector sum of the magnetization in the plane of the spins to decay to zero. This decay of the spin magnetization in the plane perpendicular to the static field is known as the free induction decay (FID) and is characterized by its decay rate, T_2^* . A simple method comprised of another magnetic pulse with twice the duration of the first pulse flips the spin vectors 180 degrees. After the flip, the leading spins now find themselves behind the other spins and the lagging spins find themselves at the front of the diffusion. As a result, the magnetization vectors begin to reconverge. At some later time, all the spin vectors are aligned again in the same direction. This realignment creates a “spin echo” which can be recorded as an induced voltage in the receiver coil. As the time between the excitation pulse and the realignment pulse is increased, the spin echo amplitude decays. Neglecting microscopic molecular diffusion, the characteristic decay time is known as the spin-spin or transverse relaxation time and is denoted as T_2 . The amplitude of the spin echoes can be used to determine spin density, T_1 and T_2 .

Please amend paragraph [0023] as indicated:

[0023] It is the intention of the design that the transmission coil is longer along the z-axis than the full possible extent of the receiver coils. Separating the transmission coil and the receiver coil from each other, and simultaneously increasing the overall area of the transmission coil over that of the receiver coil ~~overcome~~ overcomes many prior constraints. As an example, in prior art, a single coil acts as transmitter and receiver and cycles from one mode of operation to the other. In this prior design, when the coil is in receiver mode, substantial amounts of fluid which have not been excited by the initial pulse in the cycle can move into the sensitive region. As a result, some of the nuclei observed during the receiving portion of the cycle are not properly oriented and become a source of error. This error becomes greater as the longitudinal speed of the NMR device allowing more untreated spins to move into the region. As a result, this phenomenon imposes a practical upper limit to the effective logging speed of prior art. Separating the roles of the transmission and receiver cycles addresses this problem.

Please amend paragraph [0028] as indicated:

[0028] An embodiment of the invention allows for the ability to create azimuthal images of the borehole, providing greater detail. Utilizing many sensors gives this invention an advantage over prior art. Multiple sensors can be arrayed along the circumference of the borehole logging tool. In a preferred embodiment for this purpose, the tool has four sensors extending around the circumference of the tool, each of which can be placed against the wall of the borehole. Measurements made by the individual sensors may be analyzed to give relative dip information using known methods. Further detail can be achieved by rotating the sensor assembly by 90^0 ~~along its longitudinal axis~~, thereby orienting the assembly tangentially to the logging tool. This is shown in **Fig. 3** where the sensor is rotated so that the y-axis is now parallel to the tool axis and the direction of motion while logging is along the y-axis. The z-axis of sensor may be deformed into an arc so that the sensor front more closely conforms to the borehole wall when pressed against it. The multiple (three are shown) receiver coils are now spaced along the circumference of the borehole and provide azimuthal resolution. As an example, for an 8.5-inch borehole, a sufficient imaging device would require four sensor assemblies, with six coils per sensor, with each coil being one inch in length. An azimuthal sensing capability is taught in U.S. Patent 5, 977,768 to *Sezginer* et al in the context of a measurement-while-drilling tool. Measurements are made over a limited circumferential sector. This makes it possible in near horizontal boreholes to differentiate between two

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proximate beds with different porosities. The *Sezginer* device does not, however, have the resolution of the present invention and is not designed for high speed logging.